DOCUMENT RESUME

ED 442 458 IR 020 041

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TITLE Technological Literacy and Its Effects on First-Year Liberal Studies College Students.
PUB DATE 1999-04-00
NOTE 15p.; Paper presented at the Annual Meeting of the American Educational Research Association (AERA) (Montreal, Quebec, Canada, April 19-23, 1999).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *College Freshmen; *Computer Literacy; Computer Uses in Education; Critical Thinking; Higher Education; Information Technology; Instructional Development; Instructional Effectiveness; *Introductory Courses; Skill Development

ABSTRACT

This study examined the effects of including a technology literacy component in first-year students' programs at a liberal arts college. The program was designed to systematically help students use and critically evaluate the technology and what it can do to enhance the living and learning environment. The study employed a non-equivalent control group design, identifying one treatment group and two control groups from intact classes of first-year students. The treatment consisted of 10 hours of instruction in digital systems and applications. The technology literacy component was taught in a computer lab and was volitional on the part of the student. Topics addressed were: e-mail; word processing (at three levels); World Wide Web; computer basics; Web publishing (at two levels); using Excel; and digitizing graphics. Questionnaires were administered at the beginning and end of the semester to all students. Pre-questionnaire scores indicated few differences between the mean scores for each group. Post-questionnaires revealed consistent differences, with the students in the treatment group having the highest mean scores for reported skills and perceptions. Results indicate the benefits of having a technology literacy component in students' first year of college. (AEF)

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Technological Literacy and Its Effects On First-Year Liberal Studies College Students

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Students enter Liberal Arts Colleges, on average, with little experience using digital information and communications systems. Few students have had systematic instruction in ethics and the selection, access, and use of worldwide digital systems and computer applications. Yet, on the first day of classes, first-year students are virtually "dropped" into one of the most sophisticated digital information and communications systems the world has so far seen; and they are expected to use it wisely and efficiently. There is a need for students to learn to use and critically evaluate new digital communications, information, and entertainment systems. Increasingly, technological improvements in digital storage and retrieval and the convergence of information and communications technologies are opening doors to information and entertainment that is unlike any other learning environment in the history of the world. As a result,

- Students need to be empowered to use the new digital systems to enhance and extend their living and learning environment.
- Students need to be aware of the new digital systems' capabilities for manipulating information and communication and the extent to which such systems provide information and communication that is of value to the individual and their future interests and the world in which we live.
- Students need to develop an ethical sensitivity towards the social, cultural and personal implications associated with the selection, access, and use of information and communications via new digital systems and technologies.

A technology literacy component, integrated into a student's first year of college, can provide for equal opportunity in education. It can help prepare all students with the knowledge and skills about digital systems and applications they will need for living and learning in our modern society.

It is paramount that systematic instruction and education accompany the integration of these new digital systems into our society, culture, and psyche. Educators, worldwide, need to take a fresh look at the "basics" of their general education curriculum and question its adequacy providing students with the knowledge and tools to realize the potential the new digital communications and information systems hold for the good of all humankind. Such important educational needs cannot be left to chance. A technology literacy component, included in first-year students' programs, will systematically help students to use and critically evaluate the technology and what it can do to enhance the living and learning environment.

Methodology

This study employed a non-equivalent control group design, identifying one treatment group, and two control groups from intact classes of first-year students. One control group was chosen at random and the other was selected because it involved the use of technology in course presentations. There were seventeen subjects in the treatment group and the randomly selected control group. There were sixteen subjects in the selected control group.

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All subjects were administered a questionnaire at the beginning and end of the semester. The questionnaire tested for knowledge about computers and digital information systems and also asked them to self-report on their ability to use various applications and their competence. Questions were also asked about the amount of time they spent each week with computers and whether they thought that a technology literacy component would be useful to all first-year students. (See Appendix A)

The Population:

This study was conducted at Gustavus Adolphus College, in St. Peter, MN, where all first-year students enroll in a first-term seminar in a discipline of interest. The students involved in the study were all first year students enrolled in a first-term seminar. Students could choose from thirty-seven first-term seminars. Every department offered at least one first-term seminar for one semester credit. All first-term seminars addressed:

- the habits of critical thinking that are central to the liberal arts.
- intensive practice in the primary medium for intellectual discourse, writing.
- the ability to intelligently discuss important issues and to make brief formal presentations.
- the ability to reflect on the values inherent in a particular body of knowledge, to recognize the social, moral and ethical implications of that knowledge, and to move toward intellectual, emotional and relational commitments.

First-term seminars met for four hours each week; and to maintain close contact with students, instructors were encouraged to meet on four different days during the week. Enrolment in the seminars was limited to eighteen students.

The Treatment:

The treatment consisted of ten hours of instruction in digital systems and applications. The technology literacy component was taught in a computer lab and was volitional on the part of the student. Students were not required to attend and they were not held accountable by any academic grade. The hour spent each week, was over and above the four hours spent in class with the instructor. However, attendance was taken each week and there was only a 5% absentee rate over the ten week period. The topics addressed were:

- Week one: Email
- Week two: Email and Word Processing
- Week three: The World-Wide Web
- Week four: Computer Basics
- Week five: Word Processing II
- Week six: Word Processing III
- Week seven: WEB Publishing
- Week eight: WEB Publishing II
- Week nine: Using Excel
- Week ten: Digitizing Graphics

As the reader has already surmised, the topics are a beginners guide to technology literacy. There is nothing in-depth or demanding about the component. These ten hours of instruction are truly an incipient program aimed at "leveling the playing field" for all first-year students.

The selected control group taught students how to use PowerPoint as a presentation tool. That first-term seminar was a communications/speech course and all students were

instructed in the use of presentation media. As a result, we thought it would be appropriate to compare the results of our "systematic" technological literacy component with the results of an integrated approach to technological literacy.

The randomly selected control group did not teach about or with technology.

The Instrumentation:

The questionnaire was administered at the beginning and end of the semester to all students. All questionnaires were numbered and matched to individual students. Twelve knowledge questions were asked about computers and technology use in society and a score was generated for each student's knowledge of computers. The questionnaire asked students to report:

- The number of hours using a computer per week
- The percentage of time spent on a computer for entertainment
- The percentage of time spent on a computer for communication
- The percentage of time spent on a computer for information
- The percentage of time spent on a computer for browsing
- The percentage of time spent on a computer for other

Students were also asked to rate and indicate:

- Their word-processing skills
- Their email skills
- Their WWW skills
- Their spreadsheet skills
- Their computer graphics skills

As well, students were asked to rate their Overall Computer Literacy/Technology Skills. On the post-questionnaire only, students were asked to indicate:

- How often they were able to help others with computing problems
- How often they sought help about computer problems
- Whether computer literacy workshops were valuable educational experiences, and
- In an open-ended question, whether a computer literacy component should be integrated into first-term seminars.

To corroborate the students' responses to the questionnaire, professors were asked to provide the researcher with quality examples of papers written by students. Professors were asked to look at form, rather than content, when selecting quality examples.

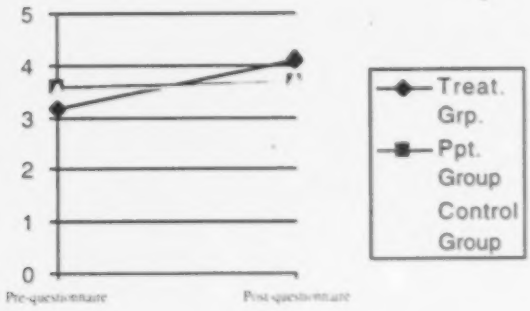
Results

The Pre-questionnaire scores were eyed for differences and there appears to be no educational, social, or perception difference between groups. As the graphs indicate, there appear to be few differences between the mean scores for each group.

The Post-questionnaire indicates that there are differences between groups and these differences are consistent throughout each response to the questionnaire. In every skill, students' mean score indicated that they perceived and reported their skill level to be greater if they had undergone the treatment. The groups' mean scores, who were trained in the use of PowerPoint, also improved in perceived skill acquisition. The control group virtually stayed the same as their pre-questionnaire results. In every reported skill or perception, the Treatment Group's mean score was highest, followed by the PowerPoint Group, and then the Control Group. The tables and figures below provide mean scores for the groups and graphed results.

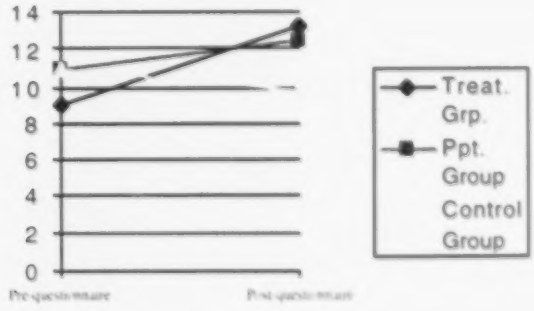
Rating Word-processing Skills
(0 = Never Used, 5 = Excellent)

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	3.2	4.1
PowerPoint Group	3.6	3.7
Control Group	3.5	3.7



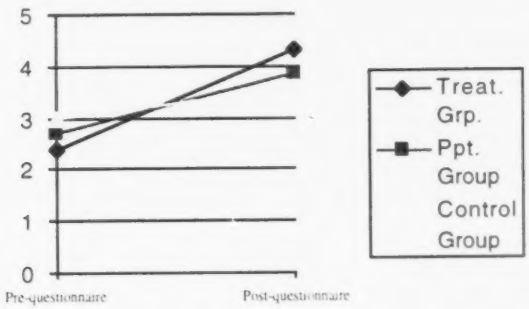
Self-Reported Word-processing Skills Score

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	9	13.2
PowerPoint Group	11	12.4
Control Group	11	9.8



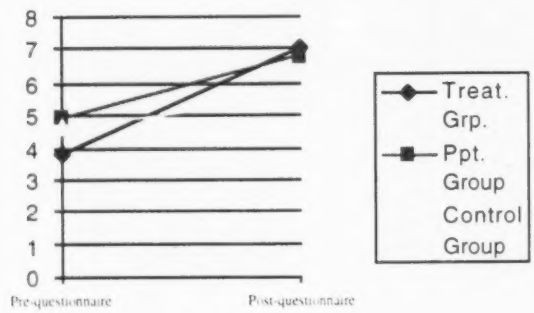
Rating Email Skills
(0 = Never Used, 5 = Excellent)

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	2.4	4.3
PowerPoint Group	2.7	3.9
Control Group	3	3.6



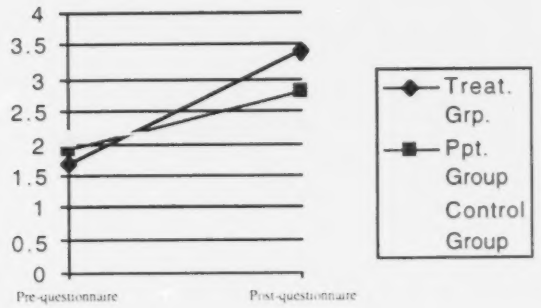
Self-Reported Email Skills Score

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	3.8	7
PowerPoint Group	4.9	6.8
Control Group	4.6	5.5



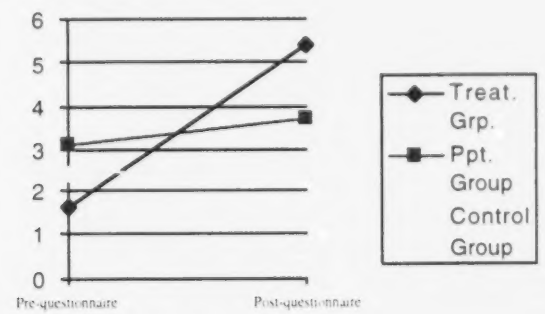
Rating WWW Skills
(0 = Never Used, 5 = Excellent)

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	1.7	3.4
PowerPoint Group	1.9	2.8
Control Group	2.1	2.3



Self-Reported WWW Skills Score

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	1.6	5.4
PowerPoint Group	3.1	3.7
Control Group	2.4	2.6



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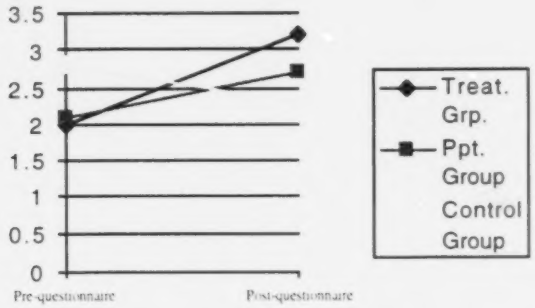
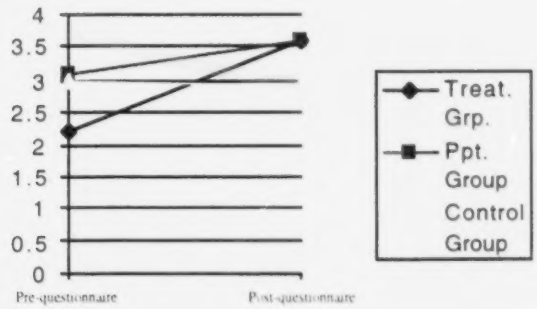
Rating Spreadsheet Skills
(0 = Never Used, 5 = Excellent)

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	2	3.2
PowerPoint Group	2.1	2.7
Control Group	2.8	2.3



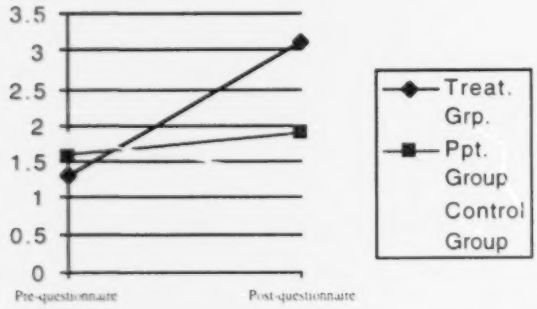
Self-Reported Spreadsheet Skills Score

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	2.2	3.6
PowerPoint Group	3.1	3.6
Control Group	3	2.9



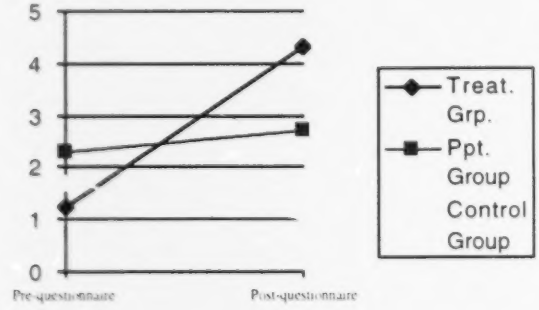
Rating Computer Graphics Skills
(0 = Never Used, 5 = Excellent)

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	1.3	3.1
PowerPoint Group	1.6	1.9
Control Group	1.8	1.3



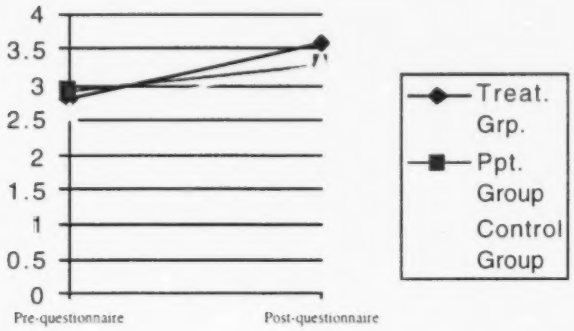
Self-Reported Computer Graphics Skills Score

	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	1.2	4.3
PowerPoint Group	2.3	2.7
Control Group	1.7	1



Overall Computer Literacy/Technology Skills Rating
(1 = Poor, 5 = Excellent)

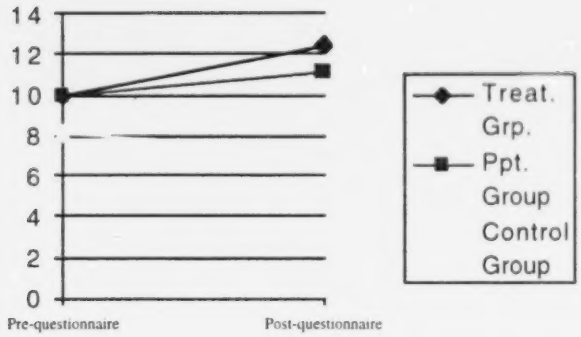
	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	2.8	3.6
PowerPoint Group	2.9	3.3
Control Group	2.6	3.3



Groups were also tested on their knowledge of computers and digital systems in society. The three groups' mean scores were similar in the pre-questionnaire, indicating that there was little educational difference between groups. The post-questionnaire results indicated that once again the Treatment Group's mean score was highest, followed by the PowerPoint Group and the Control Group stayed virtually the same. The table and figure below indicates the groups' mean scores for the pre-questionnaire and the post-questionnaire.

Digital Systems and Society Average Score

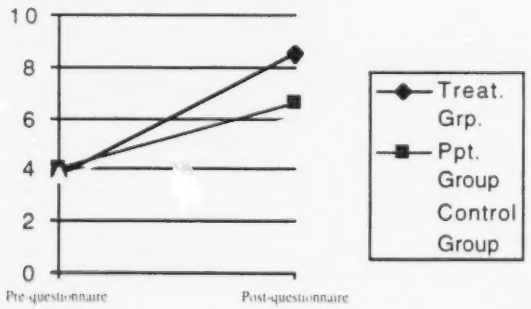
	Pre-questionnaire Mean Score	Post-questionnaire Mean Score
Treatment Group	10	12.4
PowerPoint Group	10	11.1
Control Group	8.1	7.3



The pre-questionnaire indicated that all groups were again similar in the number of hours per week they used a computer. However, while the post-questionnaire indicated that all groups used a computer more hours per week, the Treatment Group used the computer most, followed by the PowerPoint Group and then the Control Group. The pre-questionnaire and post-questionnaire results follow in the table and figure below.

Number of Hours Using a Computer per Week

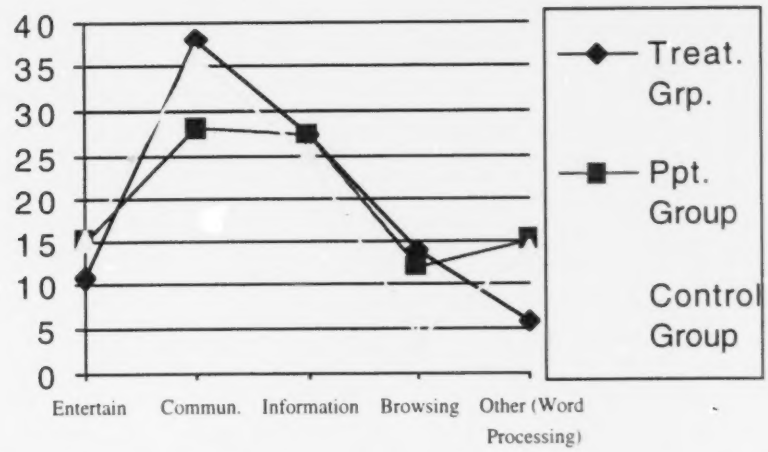
	Pre-questionnaire Mean # of Hours	Post-questionnaire Mean # of Hours
Treatment Group	3.7 hours	8.5 hours
PowerPoint Group	4 hours	6.6 hours
Control Group	3.7 hours	6.1 hours



The pre-questionnaire indicated that the groups were very similar in the way they spent their time on the computer. The table and graph below indicate the mean percentage of time each group spent using the computer for entertainment, communication, information, browsing, and other. On their surveys, students indicated that "other" means word processing.

Pre-questionnaire Mean Percentage of Time Spent on a Computer Used for Entertainment, Communication, Information, Browsing, and Other (Word Processing)

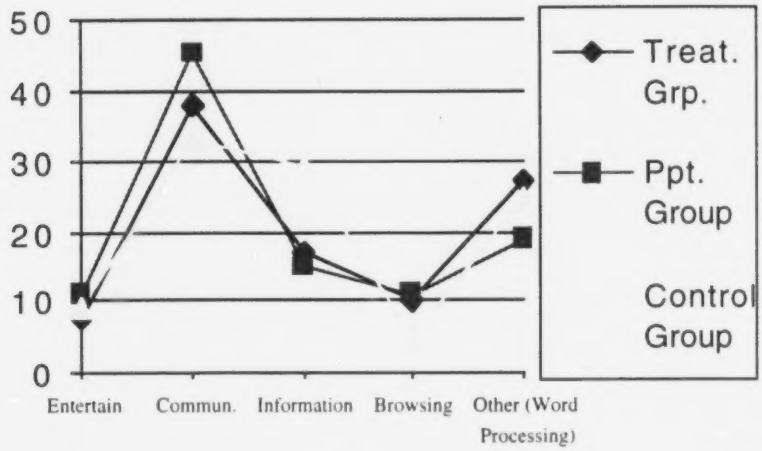
	Pre-Entertain	Pre-Commun.	Pre-Information	Pre-Browsing	Pre-Other (WP)
Treat. Grp.	11%	38%	27%	14%	6%
Ppt. Group	15%	28%	27%	12%	15%
Control Grp.	15%	36%	25%	4%	14%



The post-questionnaire indicated that the groups ended up differently in the way they spent their time on the computer. The table and graph below indicate the mean percentage of time each group spent using the computer for entertainment, communication, information, browsing, and other. On their surveys, students indicated that "other" means word processing.

Post-questionnaire Mean Percentage of Time Spent on a Computer Used for Entertainment, Communication, Information, Browsing, and Other (Word Processing)

	Post-Entertain	Post-Commun.	Post-Information	Post-Browsing	Post-Other (WP)
Treat. Grp.	8%	38%	17%	10%	27%
Ppt. Group	11%	45%	15%	11%	19%
Control Grp.	9%	33%	29%	5%	25%



Most noticeable in eyeing the data is the difference in percentage of time spent on a computer looking for information. The Control Group seems to spend more of their computer time searching for information. The Treatment Group and PowerPoint Group seem to spend more of their computer time communicating. And the Treatment Group seems to spend more time than the others word-processing.

The post-questionnaire asked students to respond in an open question, did they think a computer/technology literacy component would be a valuable addition to the First-term seminars. All students responded to this question and their language was positive in every instance. Virtually 100% of the students thought that it would be a good idea to include such a component.

Qualitative Results

As noted in the instrumentation, professors were asked to provide the researcher with quality examples of papers written by students to corroborate the students' responses to the questionnaire. Professors were asked to look at form, rather than content, when selecting quality examples.

Selected papers from the Treatment Group tended to be more aesthetic and incorporated more formatting capabilities of the word-processing program than students' papers from the other two groups. The PowerPoint Group and the Control Group tended to produce convention papers with traditional formatting. The Treatment Group's papers incorporated:

- Pictures downloaded from the WWW
- Text wrapped around the pictures
- Use of headers and footers for page numbering and identification
- Use of tables for displaying data
- Integration of spreadsheet data into the word-processing text
- Display of data using charts generated in the spreadsheet and linked to the word-processing document
- Use of bold, underlined, and italicized fonts
- Use of lines and boxes to set off titles and sub-titles.

The other two groups did not use any of these formatting techniques.

Conclusion

The results of this study indicate that a technology literacy component in students' first year of College tends to provide for equal opportunity in education by systematically providing all students with knowledge and skills on the selection, access, and use of computer-based technologies. Computer-based technologies are the tools our students' will need in the future. They will be their primary means and sources of communication, information, and entertainment.

A technology literacy component in the first year of College seems to provide students with knowledge and skills that lead to the use of more powerful communications strategies. When one considers the impact that computer-based technologies are having on our society, it seems logical to think that all Liberal Arts Colleges should at least provide first-year students with the basics of word-processing, WWW searching and site-construction, electronic data collection and analysis, email communications, and graphics generation. These are the tools and strategies that they will need to be successful in a Liberal Arts College.

Recommendations

First, students have an educational right to access to knowledge and skills about computer-based technologies. All first-year students should be provided with the knowledge and skills they need to select, access, and use computer-based technologies. This will diminish the need to provide such instruction later in their College career. This will reduce costs by eliminating the need for individualized instruction in the future. Students will be empowered to assist other students who have instructional needs regarding computer-based technologies and ethics. The potential for peer teaching will be greatly enhanced at no extra cost.

Second, students need to be educated about the ethics associated with computer-based technology selection, access and use. It seems logical that Liberal Arts Colleges should systematically teach students about computer-based technologies and help to guide students in their choices by including an ethical dimension into the instruction. Central to teaching about computer-based technologies is the idea that such systems **are not** a neutral means of disseminating information, communication, and entertainment. Crucial questions are who is formulating the information, on what ideological and political basis are the selections made and for what purpose is the information and entertainment conveyed? When these issues are understood, students will have the power to make informed and ethical decisions about the messages they receive, transmit, store and retrieve.

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